Laser Femto-Tesla Magnetic Gradiometer (LFMG), Phase I

Completed Technology Project (2009 - 2009)

Project Introduction

This Phase 1 SBIR proposal describes development of a conceptual design for a Laser Femto-Tesla Magnetic Gradiometer (LFMG). The LFMG innovations include the ability to make both extremely high-resolution scalar field measurements (10 fT/rtHz) as well as stable and accurate scalar gradiometer measurements. The high stability of the gradiometer measurements makes possible exploratory investigations of temporal variations and gradients in the magnetic field at the Earth's surface due to crustal field changes, core changes, ELF and ULF magnetospheric disturbances, and surface electromagnetic effects associated with earthquakes and volcanic activity. LFMG instruments can be deployed as station magnetometers in gradiometer arrays to monitor geopotential gradient variations over ranges from meters to kilometers. Recently, an extremely high-resolution scalar measurement technique achieving 39 pT/rtHz sensitivity was demonstrated under Navy sponsorship. High-accuracy data linking for vector gradient measurement was demonstrated under the ONR 3MDS Program. The LFMG combines these key innovations to develop an instrument for exploratory research in geomagnetism. The Phase 1 effort will result in an LFMG conceptual design and establish the feasibility of designing and fabricating a brass-board in Phase 2. A plan for the LFMG brass-board installation, calibration, and performance evaluation will be developed for demonstration in Phase 2. The TRL is expected to be 4 at the end of the Phase 1 contract.

Primary U.S. Work Locations and Key Partners

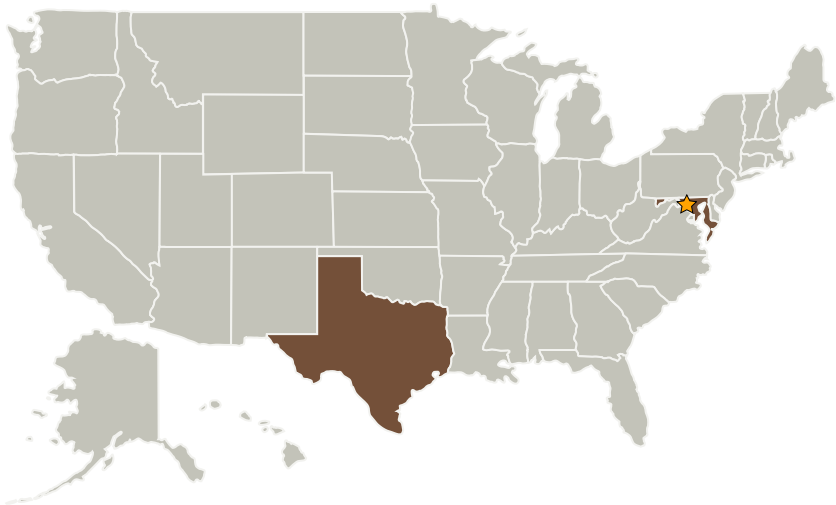

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Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Goddard Space Flight Center (GSFC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Polatomic, Inc.	Supporting Organization	Industry	Richardson, Texas

Primary U.S. Work Locations	
Maryland	Texas

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers